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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,204	09/22/2003	Gang Wang	031188	5746

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EXAMINER	
SEFER, AHMED N	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 05/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/665,204	WANG ET AL.	
	Examiner	Art Unit	
	A. Sefer	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *14 and 17-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13,14 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed February 21, 2006 has been entered and claims 1-13, 15 and 16 have been cancelled.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, **a semiconductor optical waveguide path (claim 22)** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The application as originally filed does not specifically support the claim limitation "... further comprising a contact layer of the first conduction type that is interposed between the semi-insulating substrate and the buffer layer, the contact layer having impurity concentration, with a predetermined potential being supplied to the contact layer". The specification merely discloses (see pp. 8, lines 29-35) that a predetermined potential is supplied to each of the n-side and p-side electrodes. There is no discussion in the specification about a predetermined potential being supplied to the contact layer or that the n-side and p-side electrodes having a high impurity concentration.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art (APA) in view of Takahashi JP 59-161082 (of record) and Fujimura et al. ("Fujimura").

The APA discloses in fig. 9 a semiconductor light-receiving device comprising: a semi-insulating substrate 111; a semiconductor layer 112 of a first conduction type that is formed on the semi-insulating substrate; a buffer layer 113 of the first conduction type that is formed on the semi-insulating substrate and has a lower impurity concentration than the semiconductor layer of the first conduction type; a light absorption layer 114 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer 117 of a second conduction type that is formed on the light absorption layer; and a semiconductor intermediate layer 115/116, but discloses neither a semiconductor intermediate layer interposed between the buffer layer and the light absorption layer nor a light receiving surface on the bottom surface of the semi-insulating substrate.

Takahashi discloses in fig. 3 a semiconductor light-receiving device comprising: a substrate; a buffer layer 2 of the first conduction type that is formed on the substrate; a light absorption layer 3 that is formed on the buffer layer; a semiconductor layer 5 of a second conduction type that is formed on the light absorption layer; and a semiconductor intermediate layer 9 that is interposed between the buffer layer and the light absorption layer, and has a forbidden bandwidth within a range lying between the forbidden bandwidth of the buffer layer and the forbidden bandwidth of the light absorption layer.

Fujimura discloses in fig. 1 a semi-insulating substrate 2 and a light receiving surface on the bottom surface of the semi-insulating substrate.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the APA by incorporating a semiconductor intermediate layer since that would prevent deterioration of light receiving characteristics as taught by Takahashi. It would have been obvious to incorporate a light receiving surface on the bottom surface of the semi-insulating substrate so as to improve light-receiving sensitivity of the device as taught by Fujimura.

7. Claims 17-19, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajisawa in view of Vilela (both of record).

Ajisawa discloses in fig. 6 a semiconductor light-receiving device comprising: a semi-insulating substrate; a buffer layer 64 of the first conduction type that is formed on the semiconductor layer; a light absorption layer 66 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer of a second conduction type 67 that is formed on the light absorption layer; a semiconductor intermediate layer 65 of the first conduction type that is interposed between the buffer layer and the light absorption layer, but lacks anticipation of a semiconductor layer of a first conduction type that is formed on the semi-insulating substrate or a semiconductor intermediate layer having a higher impurity concentration than the buffer layer.

Vilela discloses in fig. 4 a semiconductor light-receiving device comprising: a semiconductor layer of a first conduction type (bottom layer) and a high-concentration semiconductor intermediate tunneling layer (third layer from bottom) having a higher impurity concentration than a buffer layer (second layer from bottom).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Vilela's teachings with Ajisawa's device since that would produce a desirable characteristics of a tunnel junction as taught by Vilela.

As for claims 18 and 19, the specification contains no disclosure of either the critical nature of the claimed arrangement or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Regarding claim 21, Ajisawa discloses a light absorption layer 66 and the semiconductor layer of the second conduction type 67 form a mesa structure, with light entering the light absorption layer through a side surface of the light absorption layer that is exposed in a process of forming the mesa structure.

Regarding claim 22, Ajisawa discloses (par. 3, lines 55-60) a semiconductor waveguide path formed on a semi-insulating substrate.

8. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe ("Watanabe") JP 6-90016 (of record) in view of Vilela.

Watanabe discloses in fig. 5 a semiconductor light-receiving device comprising: a semiconductor substrate 21 of a first conduction type; a buffer layer 24 of the first conduction type that is formed on the semiconductor substrate and having a lower impurity concentration than the semiconductor substrate; a light absorption layer 26 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer 27 of a second conduction type that is formed on the light absorption layer; and a high-concentration

semiconductor intermediate layer 25 of the first conduction type that is interposed between the buffer layer and the light absorption layer but lacks anticipation of the intermediate layer having a higher impurity concentration than the buffer layer.

Vilela discloses in fig. 4 a semiconductor light-receiving device comprising: a high-concentration semiconductor intermediate tunneling layer (third layer from bottom) having a higher impurity concentration than a buffer layer (second layer from bottom).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Vilela's teachings with Watanabe's device since that would produce a desirable characteristics of a tunnel junction as taught by Vilela.

As to the semiconductor intermediate tunneling layer allowing electrons to pass therethrough to the buffer layer due to tunnel effect, it is a desired result rather than a structural limitation. See In re Schreiber, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997); See also In re Swinehart, 439 F.2d210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971; In re Danly, 263, F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959).

Response to Arguments

9. Applicant's arguments with respect to Buchanan US PG-Pub 2003/0211648 have been considered but are moot in view of the withdrawal of Buchanan.

10. Applicants argue that the combined references of Ajisawa/Watanabe and Vilela do not disclose the all elements of claim 20. Particularly, Applicants argue that Ajisawa's clad layer 65 is not the tunneling layer and that Vilela is not the light-receiving device.

11. In response to the argument that Ajisawa's clad layer 65 is not the tunneling layer, it is noted that Ajisawa discloses that layer 65 is a high-concentration layer that is interposed between

a buffer layer and a light absorption layer and the buffer layer has a lower impurity concentration than the layer 65. Furthermore, the functional language in the claim "... electrons to pass ... due to a tunnel effect" does not structurally distinguish the claim over Ajisawa.

12. In response to the argument that Vilela is not the light-receiving device, the recitation "... light-receiving device" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Sefer whose telephone number is (571) 272-1921.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915.

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ANS
May 8, 2006